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A Functional Analysis of Verbal Delay in Preschool Children: Implications for Prevention and Total Recovery

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Delays in acquiring age-appropriate verbal repertoires in preschool children with no known organic etiology may be explained by defective or absent behavior-environmental contingencies. This paper presents six possible behavioral paradigms that describe verbal episodes between parents and their preschool children and how these interactions may inhibit or prevent the acquisition of verbal behavior. These paradigms are contrasted with parent-child interactions that typically result in age-appropriate verbal repertoires. Identifying the reinforcement contingencies that produce delays in acquisition of verbal behavior could lead to the development of more effective behavioral programs for remediating nonorganic language delay. Recommendations for prevention, treatment and total recovery from functional verbal delay and associated mental retardation are presented. The relation between contingency-shaped and rule-governed behavior in the shaping of verbal behavior is discussed.

One of the more important questions facing parents of verbally delayed children and professionals working with them is why children with no apparent neurological, genetic or organic impairment fail to acquire age-appropriate verbal behavior repertoires. A behavioral analysis of the factors responsible for functional (nonorganic) language delay, when combined with behavioral methods for teaching verbal behavior, could contribute materially to the design of more effective treatment strategies for the prevention, remediation and total recovery from functional verbal delay and associated mental retardation in preschool children. Our previous research with autistic, Down syndrome and other verbally delayed preschool children has helped us identify a number of behavior-environmental relations or paradigms that appear functionally related to deficient verbal repertoires (Drash, 1982; Drash & Leibowitz, 1973; Drash, Raver, Murrin, & Tudor, 1989; Drash & Tudor, 1989, 1990, 1991). This paper analyzes those behavior-environmental relations that may prevent some preschool children from acquiring age-appropriate verbal repertoires.

Our analysis will focus on children with no known organic basis for their delay in acquisition of age-appropriate verbal behavior. In these cases there is no diagnosed evidence of central nervous system damage either at birth or occurring as a result of later trauma or infection, nor is there any evidence of genetic anomaly. This distinguishes functional language delay from organic language delay which includes genetic anomalies or neurological problems associated with the central nervous system. Functional verbal delay is, by definition, produced by absent or defective reinforcement contingencies which occur

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during the preschool child's early development. Distinguishing between these two forms of delay is not merely academic, but has important theoretical and practical implications. The prognosis for prevention, total recovery or significant remediation varies considerably with the origin of the delay. Some children whose deficient verbal repertoires are functionally based may totally recover, whereas, children with organic or genetic language delays typically do not achieve age-appropriate verbal repertoires (Bijou, 1983; Drash, 1982; Drash & Tudor, 1990).

It is possible that a child who has failed to acquire an age-appropriate verbal repertoire might have some underlying neurological impairment that goes undetected and undiagnosed. It is, of course, impossible to completely rule-out the existence of a subtle organic component. However, the assumption of an organic etiology frequently implies a relatively permanent disability and a negative prognosis for treatment. Conversely, the assumption of a functional etiology usually implies a more positive prognosis for behavioral treatment and the possibility for total or near total recovery (Drash, Raver, & Murrin, 1987; Lovaas, 1987). Unless there are definitive neurological or genetic indications, the most practical working assumption is that the delay in verbal behavior is functional.

A THEORETICAL BASIS FOR PREVENTION OF FUNCTIONAL VERBAL DELAY

As Skinner (1957) observed, one of the more important human evolutionary events occurred when our vocal musculature came under operant control. Verbal behavior is subject to the same contingencies of reinforcement that control nonverbal behaviors. "The process of 'operant conditioning' is most conspicuous when verbal behavior is first acquired. The parent sets up a repertoire of responses in the child by reinforcing many instances of a response" (p. 29). The operant nature of verbal behavior has important implications both for shaping normal verbal behavior and for remediating verbal delays. Since verbal behavior evolves in most young children through a series of changing contingencies of reinforcement, these can be discovered, analyzed and explicitly programmed for young children with existing delays in their verbal repertoires. Theoretically, prevention of all functional delay might be possible. All preschool children at risk for functional verbal delay could potentially achieve age-appropriate verbal repertoires if absent or defective reinforcement contingencies were replaced with more effective ones (Drash, 1992a, 1992b). From a practical perspective, not all cases of functional verbal delay can be prevented, since it is often impossible to control or modify existing contingencies of reinforcement. However, if begun before a child is one-and-a-half or two years of age, behavioral language intervention programs could produce relatively total recovery for many verbally delayed preschool children who would previously have been considered non-remediable. In those instances in which prevention or total recovery is not achieved, very early intervention could produce a substantial improvement in the degree of recovery obtained (Drash, 1992b; Drash & Raver, 1987; Drash, Raver, & Murrin, 1987; Drash & Tudor, 1989, 1990; Lovaas, 1987).

A FUNCTIONAL ANALYSIS OF THE ETIOLOGY OF NONORGANIC VERBAL DELAY IN PRESCHOOL CHILDREN

Our observation and analysis of verbal interactions among several hundred verbally delayed preschool children and their parents suggests there are at least six parent-child reinforcement paradigms that can be related to the failure of some preschool children to acquire age-appropriate verbal behavior. Some paradigms occur more frequently than others. Paradigms 1 or 2 have occurred in well over half of the families we have examined. Although verbal delays occur more frequently in some socioeconomic groups than others, we have observed delays in verbal behavior across all socioeconomic levels (Drash & Tudor, 1990). The following paradigms may occur

separately or in combination to produce verbal delays.

1. Reinforcement of Noncompliance, Task-Avoidance, and Other Disruptive Behaviors That are Incompatible With the Acquisition of Age-Appropriate Verbal Behavior

Behaviors that are incompatible with the acquisition of age-appropriate mands, tacts, intraverbals and other classes of verbal behavior include noncompliance, task-avoidance and other forms of disruptive or inappropriate behaviors such as crying, screaming and temper tantrums. Many populations of verbally delayed children including those with autism and pervasive developmental disorder have disruptive behaviors as part of their repertoires. It is not widely recognized, however, *that by preventing the occurrence of reinforcable verbal behaviors, disruptive behavior is a major factor contributing to language delay.*

Our analysis of the interactions between verbally delayed children and their parents indicates that negative behavior often functions as an aversive mand. The frequency and intensity of the aversive mands are such that they are incompatible with and prevent the occurrence of acceptable verbal behavior which might otherwise be reinforced and shaped into an appropriate mand repertoire. The presence of aversive verbal behavior as a functional unit effectively prevents the establishment of an incompatible functional unit, that is, acceptable verbal behavior. Negative behavior as a functional unit is thus a major contributing factor in many if not most instances of functional verbal delay.

Shaping incompatible disruptive behaviors. Disruptive behavior in verbally delayed children is established in at least two ways, just as it is in children without verbal delay. First, by the parents not quickly suppressing the first occurrences of negative mands in infancy through extinction or other behavioral procedures, and second, by parents inadvertently providing positive reinforcement for aversive mands. Once disruptive or task-avoidance behavior is well established as an aversive mand, it is almost totally incompatible with the occurrence of reinforcable age-appropriate verbal behavior, and is, therefore, extremely resistant to modification.

The behavior of the parent or other care giver who reinforces these aversive mands can be maintained in at least two ways, either by an escape-avoidance contingency or by a punishment contingency. Here are two ways in which these contingencies may operate.

Paradigm Ia. Positive reinforcement for the child and escape-avoidance for the parent. When infants or young children mand by whining, crying, screaming or other disruptive behaviors, parents or other care givers sometimes provide reinforcement in order to terminate the aversive mand. For example, if an infant has not been fed for about three hours, this degree of food deprivation is a sufficient establishing operation (Michael, 1982, 1988, 1993) to make milk highly reinforcing. If the bottle is just beyond the child's reach, the child may mand for it by a whine or a cry. If the parent fails to reinforce the initial mand, the whimper may rapidly become a cry or scream. The increase in volume when the whine is not initially reinforced results from the evocative function of the establishing operation, that is, a prior history of differential reinforcement for loud crying when food deprived (Michael, 1993). Instead of prompting the child with, "Say 'milk'," or some other mand for an echoic response, the parent delivers the bottle contingent upon the scream, thus reinforcing screaming as a mand. If the parent later resolves to no longer provide the bottle when the child is screaming, the intensity and frequency of screaming may increase substantially, as normally occurs during extinction bursts. If the parent then provides the reinforcer as a means of terminating the highly aversive mand, even louder and more disruptive behavior would have been differentially reinforced to the exclusion of appropriate verbal behavior. Parents initially escape their child's aversive mands and subsequently avoid them by providing reinforcement immediately. After sufficient reinforcement, screaming and crying can become the child's primary

form of manding, almost to the complete exclusion of more appropriate forms of manding.

Experimental evidence demonstrating that parents may unintentionally reinforce whining and crying in infants as young as six months of age has been provided by Gewirtz (1993). In his comment on Gewirtz's research, Azrin stated (1993, p. 105), "Gewirtz considers how, in life settings, mothers often provide an abundance of *misplaced contingencies* to their infants' behaviors, which can encourage developmentally inappropriate behaviors and generate problems of infant-behavior management precluding the constructive fostering of social and cognitive competence."

Paradigm 1b. Escape-avoidance for the child and punishment for the parent. In a related paradigm, inappropriate mands may be inadvertently reinforced by parents when attempting to teach their child a tact repertoire. For example, many parents teach tact repertoires to their children by having them sit and name pictures of objects in books. Children, however, frequently resist such sedentary activities. If the child mands for termination of the aversive stimulus (i.e. sitting) by a cry, scream or tantrum, the parent may engage in escape behavior by discontinuing the interaction. The child's aversive mands will have been negatively reinforced because they were instrumental in terminating an aversive stimulus. The probability that the child will mand by screaming or crying to avoid future teaching interactions will have been increased. The aversiveness of the child's mands decreases the probability that the parent will attempt to teach the child in the future. The parent's behavior was, therefore, punished. Gradually, the parents may avoid opportunities for teaching their child, thus further reducing the probability that appropriate mands and tacts will be reinforced.

In both paradigms *1a* and *1b* the child's aversive mands are reinforced by consequences delivered by the parent. It is these aversive mands which are incompatible with the occurrence of appropriate mands which, if they occurred, might be reinforced. These behavior-environmental contingencies effectively prevent reinforcement of appropriate mands and provide the child with a functional unit of aversive mands and other negative behaviors which prevents further teaching. As observed by Sundberg (1993, p. 213), "It may be that verbal stimuli presented to the individual function like a reflexive CEO, in that these stimuli are warning stimuli indicating that more bad things are coming, and behaviors that have terminated similar stimuli in the past occur immediately."

2. Reinforcement of Non-Vocal Forms of Verbal Behavior

A problem that frequently occurs in families with verbally delayed children is that parents, older siblings, twin siblings or other family members unintentionally yet systematically reinforce nonvocal mands in their child. This occurs when the child is provided with reinforcing stimuli without first being required to mand vocally. Family members learn to "read the behavior of the child." For example, as soon as the child mands by looking at, reaching for or pointing to an object, a family member immediately provides it without first requiring an appropriate vocal mand. This reinforces and strengthens a nonvocal mand repertoire which is incompatible with the occurrence and reinforcement of appropriate vocal mands. The consequences that reinforce the parents' behavior in this paradigm are less conspicuous than those in the previous paradigm. It may be that "good parenting behaviors," which are reinforced by our culture, include responding to the child's needs immediately. Alternatively, the parents' behavior could be maintained by an escape-avoidance contingency by eliminating their concern about "frustrating their child." Either way, a repertoire of nonvocal verbal behavior is reinforced.

The consequences that reinforce the behavior of older siblings are more apparent. Older siblings often receive positive reinforcement in the form of praise from parents for "being a good helper" and for behaving in protective ways toward their

younger siblings. Older siblings learn what is reinforcing to younger children in much the same way that parents do and provide reinforcement without requiring an appropriate vocal mand. It is possible that both nonvocal mands and aversive vocal mands may be simultaneously strengthened. For example, if the reinforcing stimulus is not presented immediately following a nonvocal mand, the child may begin to mand with a whine or scream until the reinforcing stimulus is presented. In either case, the child learns to mand without using appropriate verbal response topographies.

3. Extinction of Verbal Behavior

The verbal behavior of some children may be delayed because they are isolated and left unattended for long periods of time. This places all verbal behavior on extinction. For example, one destitute single parent living with her mother was informed that she would have to move out if she could not keep her baby quiet. To placate her mother, the parent isolated her child in a separate room for long periods of time. The child became extremely verbally delayed. There are many variations on the extinction theme. Some parents intentionally ignore the verbalizations of their children, not realizing the importance of selectively reinforcing and shaping their child's verbal behavior. The maternal deprivation syndrome, which can result in severe mental retardation, appears to be an extreme form of extinction (Yarrow, 1961).

Economic and social factors have forced more married mothers and single parents into the work force (Bennett, 1994). Full-time day care has become a reality for an increasing number of American families. Unfortunately, poor quality day care, both family-owned and center-based, still exists. The extinction of verbal behavior which may occur in such settings can represent a major contributing factor to verbal delay in young children. Large numbers of preschoolers and infants are sometimes grouped together with very little adult supervision. Children are sometimes left for extended periods in high chairs, car seats or cribs with little or no reinforcement for verbal behavior provided by the staff. Similar extinction of verbal behavior may occur when infants and toddlers are left with grandparents, older siblings or baby sitters. Although these individuals may provide quite well for the physical needs of the child, they may not have the skill, energy or knowledge to systematically reinforce and shape the child's verbal repertoire.

Any parenting behavior that reduces or eliminates opportunities for parents to reinforce the verbal behavior of their children may potentially inhibit acquisition of verbal behavior. For example, in the so-called "good baby syndrome" infants may be allowed to sleep for excessively long periods of time or play unattended for prolonged periods thus reducing both the total time and the total number of opportunities available for reinforcement of verbal behavior by their parents. Other parents use television as a baby sitter, leaving their baby sitting in front of it for long periods. While some television programs are educational, most are not and do not reinforce age-appropriate verbal behavior. Television viewing reduces the amount of time parents could otherwise spend reinforcing appropriate verbal behavior. Any of these forms of isolation, extinction, or ignoring reduce the number of opportunities for parents to reinforce the verbal behavior of their children. If continued over an extended period, these behaviors may produce substantial delays in verbal behavior.

4. Suppression of Verbal Behavior by Punishment

Some parents find their children's verbal behavior to be aversive and may physically punish them when they vocalize. This is more likely to occur when children whine or cry excessively. The parent's punishment behavior is controlled by an escape-avoidance contingency designed to terminate the aversive crying of their children. The long term effect of consistent physical punishment, especially if combined with lack of reinforcement for verbal behavior, may be to suppress an entire verbal repertoire in young children.

In some cultures children are expected "to be seen and not heard." Although children may not be physically punished for producing verbal behavior, negative verbal comments by parents may serve as punishing stimuli. Moreover, verbal behavior that is not systematically reinforced may be suppressed by differential reinforcement of nonverbal behaviors. The resulting deficits in verbal repertoires of these children often are not identified until they enter educational programs at three to five years of age.

5. Absent or Ineffective Verbal Reinforcement Paradigm

There are many environmental situations which place children at risk for language delay because their parents or other care givers do not have the skills required to provide appropriate reinforcement for verbal behavior of their children. Data indicate that a disproportionate number of verbally delayed and functionally retarded children come from economically deprived families (Menolascino & Stark, 1988; Ramey, MacPhee, & Yeats, 1982). Low socio-economic status has been cited as a causal factor in verbal delay and functional mental retardation. Some have suggested erroneously that providing a larger family income would eliminate most functional mental retardation in this population. While verbal delay and functional retardation tend to occur in impoverished families, this correlation does not identify the contingencies functionally related to verbal delay.

Since verbal repertoires are acquired through reinforcement mediated by the behavior of the listener, it is necessary to analyze the reinforcement contingencies provided for verbal behavior by parents or other care givers. Parents of children in poverty are often single, poorly educated, very young (12 to 14 years of age), and frequently school dropouts (Bennett, 1994; Bijou, 1983). Infants and children of these parents may be cared for by older siblings or other young children who may provide little reinforcement for verbal behavior. Poorly educated or dysfunctional parents may have deficient verbal repertoires and provide inappropriate verbal models. In addition, they may lack the skills required to provide reinforcement for their child's verbal behavior. A relatively large proportion of these children become verbally delayed or functionally retarded (Bijou, 1983; Menolascino & Stark, 1988; Ramey, MacPhee, & Yeats, 1982).

Defective verbal reinforcement contingencies are not limited to families of low education and socio-economic status. Many well educated and financially advantaged parents do not effectively establish reinforcement contingencies to shape successively more complex verbal behavior in their children. Although such parents may recognize the importance of developing verbal behavior in their children, they may possess inadequate reinforcement skills or may not invest the time required to reinforce verbal behavior. Some parents reinforce "baby talk" directly or strengthen it by providing echoic prompts. Others spend time reinforcing physical activities rather than the verbal behavior of their children. The techniques that parents use in teaching verbal behavior to their children have a direct effect on the child's acquisition of verbal behavior (MacDonald, 1985).

Absent or defective verbal reinforcement contingencies may also occur in homes where a parent is emotionally unstable, physically or mentally abusive to the child, chronically ill or suffering from severe financial pressures. In such cases the minimum physical needs of the child may be met, but little reinforcement for verbal behavior is provided. The verbal repertoires of these children are often delayed or deficient, although less severely so than in more extreme forms of maternal deprivation.

6. Interaction Between Organic or Presumed Organic and Behavioral Factors

An analysis of the interaction between behavioral and organic factors producing verbal delay and mental retardation has been published (Bijou, 1983). Our research confirms this relationship (Drash & Tudor, 1989). Physical disabilities, such as hearing loss, directly inhibit the establishment of vocal verbal behavior. Conversely, many

physical disabilities or illnesses may have no direct effect on a child's ability to acquire or produce verbal behavior. However, the parents' response to the disability may be to reduce the requirements for their child to produce verbal behavior for fear of causing further problems. In one case, the parents of a three-year-old verbally delayed asthmatic did not mand their child to produce verbal behavior for fear the "stress" might precipitate an asthma attack (Drash & Tudor, 1989).

In some cases parents may be convinced that their child has a physical or neurological disability even though none exists. They, therefore, reduce their efforts to reinforce verbal behavior. For example, the parents of a two-and-a-half-year-old verbally delayed child believed their child had chronic ear infections because he screamed and covered his ears whenever they spoke to him. The parents discontinued their attempts to reinforce and shape his verbal behavior because they believed it caused him pain. It was later discovered that the child had no auditory dysfunction. In both examples the contingency directly controlling the behavior of the parents was escape-avoidance as discussed in *1a* above.

Although many such children might be able to achieve normal or near normal repertoires of verbal behavior, their physical or presumed physical disability caused their parents to lower expectations and discontinue reinforcing verbal behavior. The end result is a child with significant language delay, even though there may be little or no organic basis for it.

Interactions among the various paradigms. It is unlikely that these behavioral paradigms function in isolation. They most probably occur in combination and interact with one another. For example, even though a child has been reinforced for nonvocal mands, such as pointing, looking and other nonvocal behaviors, the child may mand by screaming if he does not get what he wants immediately. The parent may reinforce the aversive mand rather than the nonvocal mand of pointing. Similarly, the suppression of vocal behavior through punishment might be combined with extinction by isolating a child in his room for long periods. As these behavior-environmental interactions between the parent and child are analyzed in detail, it becomes obvious that multiple combinations of consequences can produce delays in the acquisition of an age-appropriate verbal repertoire.

A FUNCTIONAL ANALYSIS OF THE DEVELOPMENT OF AGE-APPROPRIATE VERBAL BEHAVIOR IN INFANTS

An exhaustive behavioral description of how infants acquire complex verbal behavior is beyond the scope of this paper. However, a comprehensive analysis of the acquisition of verbal behavior by children is available (Bijou, 1993; Bijou & Baer, 1965). Instead, we will focus on how reinforcement contingencies typically operate to produce age-appropriate verbal behavior, in contrast with those contingencies previously discussed that produce verbal delays.

Given that there are so many ways children might become verbally delayed, how do the vast majority of children develop complex, age-appropriate repertoires of verbal behavior? Most parents receive no formal instruction in teaching verbal behavior and are often unaware they are teaching. How then do they succeed in teaching complex verbal behavior to their children?

Both questions can be answered by combining Skinner's analysis of the evolution of behavior within the individual organism through selection by consequences, with Darwin's theory of evolution of the species through natural selection. The vocal behavior of human infants has been uniquely prepared by evolution to be highly responsive to the effects of reinforcement contingencies. Moreover, infants are predisposed to produce a wide variety of sounds spontaneously at birth. The behavior of parents has also been shaped by social contingencies to provide for the needs of dependent infants. The parent and infant constitute a reciprocal reinforcement system whereby the natural reflexive cries and other behaviors of the infant evoke reinforcing behav-

ior by the parent. The infant's response to the parent's reinforcers increases the probability that the parent will engage in further reinforcing behavior. This mutually reinforcing behavior leads to increasingly more complex verbal and behavioral exchanges. The process of acquiring verbal behavior, at least in its early stages, seems to occur almost automatically because of the naturally evolving contingencies.

The shaping of verbal behavior first begins when the parent responds to the spontaneous cries of their infant. These first vocalizations are often the result of aversive establishing operations (Michael, 1993), such as food deprivation, wet diapers or other uncomfortable or painful stimuli. These initial cries produce an attentive parent who immediately engages in behavior to terminate the crying. As the initial cries are reinforced they are shaped into operant verbal mands. The evocative function of the establishing operations (Michael, 1993) will increase the probability that the child will repeat those verbal behaviors that were previously reinforced under similar establishing operations.

As the mother, through trial and error and the topography of the cries themselves, becomes more proficient in providing the appropriate reinforcing stimuli for the child's mands, she may begin to differentially reinforce mands that more closely approximate speech sounds as opposed to more aversive mands of screaming or crying. For example, a mother may enter the crying child's room at feeding time and state, "Oh, you want your *bottle* now." In addition, she may also begin to mand for an echoic response, such as, "Say 'baba'," before providing reinforcement. The parent may also begin to shape a tact repertoire by selectively reinforcing specific sounds that approximate an acceptable tact. If the child produces "baba" in the presence of the bottle, the parent may immediately reinforce by presenting the bottle and saying, "You said *bottle*!" Or if the child produces an approximation of "mama" in the presence of mother, she may immediately hug the child, and say, "You said *mama*!" In addition, as the child, as a consequence of reinforcement, begins to produce sounds that more closely approximate those of the mother, the child's own verbal behavior may assume an *automatic reinforcing function* as discussed by Skinner (1957) and Bijou and Baer (1965, p. 160), "Hence one might say that the sound of the baby's vocalizations 'automatically' strengthens the vocalizations themselves. As a result the infant's vocal responses become both stronger and differentiated into those which more and more closely produce sounds like the mother's speech..." Eventually through a gradual shaping process, the infant's spontaneous cries evolve toward specific sounds, then words, then phrases, and finally toward functional verbal behavior.

Contributions by other investigators. The research of Bruner (1983) is also relevant to a behavioral analysis of the acquisition of verbal behavior. Although Bruner's investigative paradigm is not behavioral, his work demonstrates that both a mand and a tact repertoire are reinforced and shaped in a series of stages. He examined the development of a mand and a tact repertoire in two infants in two different families from ages 3 to 18 months based upon an analysis of videotape interactions between the infants and their mothers. Initially, there was undifferentiated vocalizing and gesturing which occurred when the child experienced physical discomfort. By three or four months of age, mothers *appeared* to respond differentially to the identifying characteristics of their child's cries. But, according to Bruner, the mother's ability to successfully reinforce the child's mand was attributable primarily to her skill in identifying reinforcing stimuli based on context or time of day, rather than upon verbal topography. Until about six months of age the infants' mands served primarily to terminate aversive physical stimuli.

Both mothers taught their child by prompting, shaping and reinforcing closer and closer approximations to a desired sound or word. They also used shaping procedures by manding their child to produce an echoic response before presenting the reinforcing stimulus. Both parents used

behavioral techniques without receiving instruction on how to reinforce and shape verbal behavior.

Although many details of the process of shaping verbal behavior remain to be elucidated, it is clear that acquisition of verbal behavior between birth and 18 months is *usually* a mutually reinforcing and self-sustaining process whereby the natural, reflexive responses of the infant evoke socially conditioned reinforcing behavior from the parent.

PRACTICAL IMPLICATIONS FOR PREVENTION, TREATMENT AND TOTAL RECOVERY FROM VERBAL DELAY

Identifying behavioral reinforcement paradigms that may inhibit or prevent the acquisition of verbal behavior during the preschool years could contribute significantly to the development of more effective behavioral programs for the prevention, treatment and total recovery from functional verbal delay and associated mental retardation in preschool children.

One of the more important practical implications of the present analysis is that the behavioral paradigms which may produce serious verbal delays might be identified during the first 12 to 18 months of an infant's life. Behavioral treatment might begin almost immediately. By initiating treatment before repertoires incompatible with appropriate verbal behavior are established, many potentially serious verbal delays, such as those occurring in autism and pervasive developmental disorder, might be prevented. In those cases in which prevention is not possible, total recovery or significantly improved verbal and intellectual functioning might result from intervention beginning before 18 months.

If identification and initiation of treatment could occur during the first 12 to 18 months, this would represent a major advance over the present referral system. Currently, pediatric referral of verbally delayed children rarely occurs before two years of age and frequently much later. The criterion for referral is usually failure to acquire functional language by two or two-and-a-half years. Because of the lengthy referral process, treatment may not be initiated until the child is four. If a child has a serious developmental problem, such as autism or pervasive developmental disorder, delaying treatment until age four greatly reduces the possibility of total or near total recovery (Drash & Tudor, 1990; Lovaas, 1987).

If the criterion of high-risk behaviors were substituted for the present criterion of delay in verbal behavior, high-risk behaviors contributing to language delay might be identified during the first year of life. Behaviors incompatible with the acquisition of appropriate verbal behavior, such as aversive manding, manding by nonvocal means, negativism, task-refusals and frequent temper tantrums, would no longer be treated as routine behavior problems, but would be viewed as possible precursors to serious language delay, developmental delay or functional mental retardation (see Drash & Tudor, 1990, for a discussion of the relation between verbal delay and functional mental retardation).

Since pediatricians are the major referral source for verbally delayed children from birth to age three, educating pediatricians regarding the importance of identifying and referring at-risk children during the first year to 18 months would be essential. To facilitate their identification of at-risk children, a program of education for pediatricians and a brief behavioral checklist of high-risk behaviors might be developed for their use.

It would also be extremely important to educate parents regarding the critical importance of teaching verbal behavior to their infants and toddlers. Parent education might be included in a variety of existing parent programs such as birthing classes, PTA programs and public education programs for parents of high-risk infants. Parents could learn some of the basic techniques for reinforcing verbal behavior and preventing the development of negative behaviors. Parents should also learn to recognize the "high-risk behaviors" and to seek help immediately rather

than taking the more traditional "wait and see" approach. Early intervention research suggests that parent education could, in and of itself, substantially reduce the occurrence of new cases of verbal delay and functional mental retardation (Bijou, 1983; Odom & Karnes, 1988).

DISCUSSION

This analysis began by asking why children with no apparent organic impairment fail to acquire age-appropriate verbal behavior. Our analysis suggests there are at least six behavioral-reinforcement paradigms which may produce serious verbal delay in such children. The analysis also suggests that the shaping of verbal behavior that normally occurs between birth and about two years of age is a mutually reinforcing and self-sustaining process between infant and parent. This usually results in age-appropriate verbal behavior repertoires. It is obvious, however, that this does not always occur. It has been estimated that almost 10% of school age children have verbal delays of various types ranging from mild to very severe (Owens, 1984). Given that the shaping of verbal behavior proceeds relatively uneventfully and successfully in most cases, why do some parents reinforce behaviors incompatible with the acquisition of appropriate verbal behavior, while others do not?

One possible explanation is that parents' shaping of verbal behavior in their infants is usually contingency-shaped rather than rule-governed (Skinner, 1969). Very few parents receive instruction in shaping complex verbal behavior. When teaching verbal behavior is contingency-shaped, every parent must discover for themselves the procedures and strategies for teaching their infant. Every infant enters the world with a unique behavioral repertoire, thus, even the experience parents gain with a first child may not necessarily generalize to the second. As Skinner (1969, chap. 6) observed, in contingency-shaped behavior there are numerous times during the shaping process when the immediate contingencies reinforce behavior incompatible with the long term goal. This is especially true in shaping verbal behavior, since there are numerous opportunities during the two-year shaping process for a misapplication of contingencies to occur.

In the early stages of shaping, the predominate verbal behavior of the infant is the mand, and the predominant mand is a cry. The immediate escape-avoidance contingencies controlling the behavior of the parent support reinforcement of aversive mand rather than shaping of more appropriate verbal behavior. Since each parent has a unique reinforcement history, some will be more predisposed to respond to aversive contingencies than others.

Because of the complexity of verbal behavior, the two-to-three year shaping period and the numerous opportunities for misapplication of contingencies, it would appear that shaping verbal behavior in normal infants would be ideally suited to a rule-governed approach. Our experience indicates that the rule-governed approach is highly effective in teaching students and parents to shape verbal behavior in developmentally delayed children (Drash & Tudor, 1989, 1990). Moreover, a technology for the analysis and shaping of verbal behavior is available (Drash & Tudor, 1991). It would appear that an instructional program for assisting parents to teach verbal behavior to their normal infants would be a major contribution to the literature on child rearing. If rather than having to develop teaching procedures for themselves, parents were given written guidelines that provided the basic procedures for shaping and reinforcing verbal behavior, it is probable that shaping verbal behavior in infants and children would proceed much more systematically.

Glenn (1993) recently emphasized the need for behavior analysts to apply behavioral technology to the solution of issues of broad social importance. Likewise, Eshleman and Vargas (1988) stressed the need to transfer verbal technology into the educational marketplace. Verbal and developmental delay, which affects approximately 10% of the school population, and which in its more severe form can be emotionally and financially devastating

to families, is one of the major problems facing special education.

The behavioral technology for reducing the incidence of verbal delay and associated mental retardation currently exists. By making the technology for shaping verbal behavior available on a national basis to parents, teachers and others concerned with the education of infants and preschool children, behavior analysts could have a substantial impact on a major social problem.

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